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MISHIMOTO ENGINEERING REPORT

Testing the 2015-2017 Ford Mustang Ecoboost Direct-Fit Oil Cooler Kit

Test Vehicle:
2015 Ford Mustang Ecoboost

Objective:
To make an oil cooler that bolts directly onto the 2015+ Ford Mustang Ecoboost.
The cooler must be robust enough for the track but still safe for street conditions.

Testing conditions:
Testing took place on a mild day with temperatures ranging from 70°F to 75°F.

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Apparatus:

For hardware, Mishimoto choose to use PLX sensor modules driven by the Kiwi WiFi plus IMFD. This is a wireless system from the sensor modules to the iPad or Laptop computer. The software used was the Palmer Performance Scan XL pro, which has full data logging capabilities.

Figure 1: PLX Kiwi WiFi device

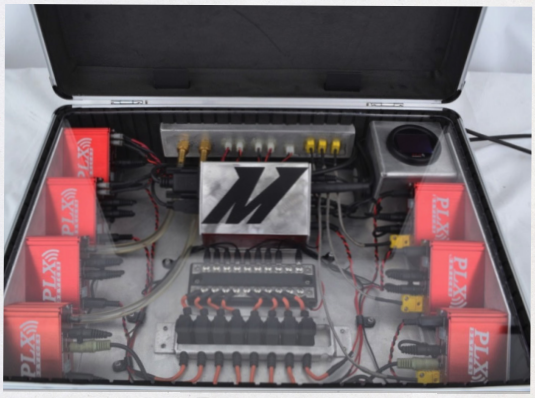

Figure 2: PLX devices and sensors were used to obtain all testing data.

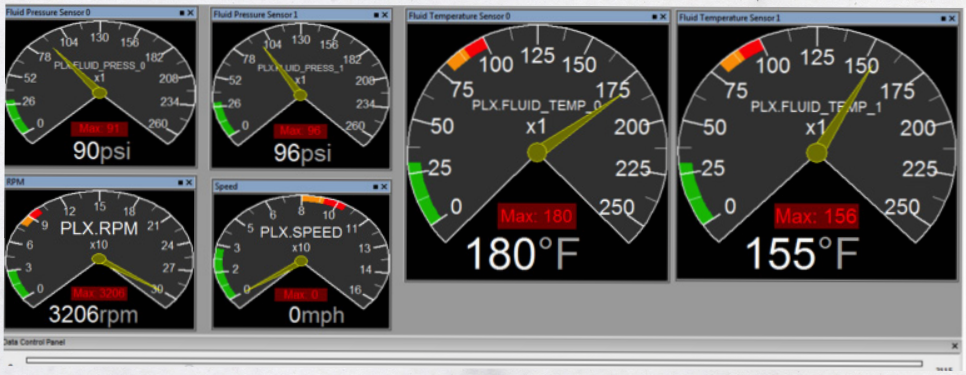

Figure 3: Palmer Performance Scan XL Pro software was used to record testing data.

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Fluid temperatures were taken with PLX fluid temperature sensors from both the inlet and outlet of the Mishimoto oilc ooler. Oil pressure was also measured to ensure that no dramatic pressure drop occurs when installing the oil cooler. A baseline temperature and pressure were recorded before the oil cooler was installed. This allowed us to see how well the cooler performed over the stock setup (which has no oil cooler).

Research and Development:

The first step in developing the direct-fit oil cooler kit was to find a suitable location to mount the oil cooler. For optimal cooling, a heat exchanger should be placed in a location that has sufficient airflow. The 2015 Mustang front bumper has an upper and lower grille that supplies ram air to the intercooler, radiator, and AC condenser. Since it's crucial that the charge air temperature stay as cool as possible, we chose to mount the oil cooler behind the upper grille. This location will ensure that the intercooler can still run at peak efficiency and the oil cooler will get a sufficient amount of air flow.

Figure 4: The upper-central location of the oil cooler allows a sufficient amount of ram air to enter the cooler without blocking airflow to the charge air cooler.

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Experiment:

The test compares the uncooled stock oil temperatures and the resulting oil temperatures with the Mishimoto 19-row direct-fit oil cooler installed. Both setups were tested until they reached steady-state conditions. To conduct the test we first let the car idle until it became heat soaked. Next, we drove the Mustang on a highway at approximately 65 mph and cruised for approximately eight miles. Special attention was given to the space between the Mustang and the car in front of it to ensure that fresh air was flowing into the oil cooler. This experiment is 100% repeatable when the test is conducted under similar weather conditions.

At steady-state conditions, the OEM operating temperature of the oil was approximately 212°F (100°C). The Mishimoto 19-row oil cooler was then installed and the same test was run. Under the same conditions, the oil temperature dropped to approximately 170°F (77°C) at the oil cooler outlet. Since this test was run without a thermostatic sandwich plate, the inlet and outlet temperatures continued to drop as the test progressed (as shown in Figure 5).

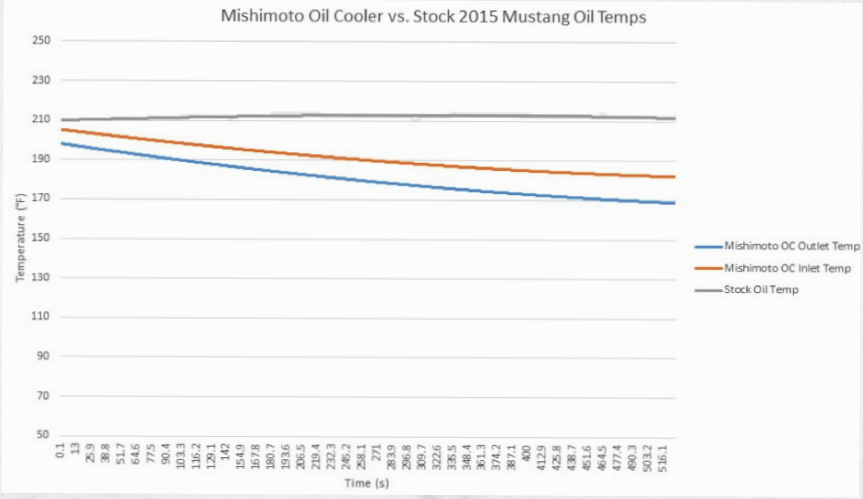

Figure 5: The oil temperature continued to drop until approximately 170 °F. The oil temperature can be expected to remain at 185 °F (85°C) if the Mishimoto thermostatic sandwich plate is installed.

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Along with oil temperature, oil pressure was recorded to ensure that the pressure loss with the cooler installed would not damage the engine. The average pressure loss was 6 psi across the Mishimoto oil cooler, and overall system pressures were slightly higher than a stock setup (no oil cooler). As shown in Figure 6, the stock oil pressure remained between 50 psi and 56 psi while the oil pressure with the Mishimoto oil cooler installed was between 58 psi and 62psi. These results are acceptable and will not cause any harm to the Mustang's engine.

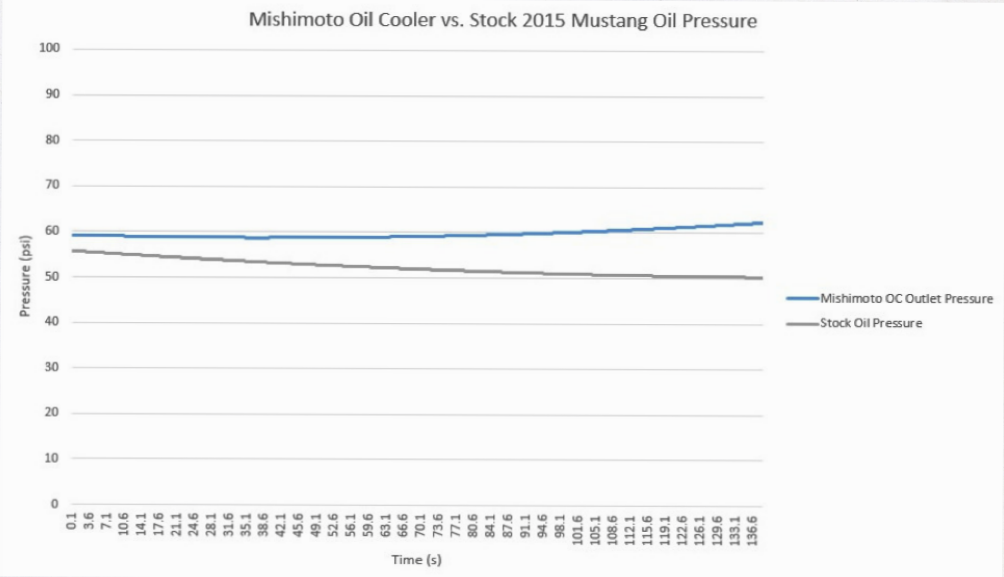

Figure 6: Oil pressure with the Mishimoto oil cooler installed remained slightly higher compared to an all-stock setup. Since overall temperatures are lower than stock (210°F vs. 170°F) the oil is more viscous with the Mishimoto oil cooler installed. This increased viscosity is likely causing the slight increase in overall pressure.

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Summary:
The testing results show that the Mishimoto oil cooler works well to reduce temperatures while maintaining safe oil pressures. An optimal location for the oil cooler was found behind the upper grille. This location allows direct airflow into the oil cooler without impeding the air flowing into the intercooler. With the Mishimoto 19-row oil cooler in place and the car driven at a steady speed, the oil temperature decreased more than 40° F compared to stock. This oil cooler is an excellent addition to the **2015-2017 Mustang EcoBoost** and will keep the oil temperature significantly cooler under both street and track conditions.

Steve Wiley
Product Engineer

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